

REMARKS

Claims 1-22 are pending in the application. Claims 1-22 are rejected.

In the Final Office Action, the Examiner rejected claims 1-6, 8, 10-11, 13-14, and 17-22 pursuant to 35 U.S.C. §102(e) as being anticipated by Jong et al. (U.S. Patent No. 6,572,549), or in the alternative pursuant to 35 U.S.C. §103(a) as being unpatentable over Jong et al. in view of Hashimoto (U.S. Patent No 6,500,118) or Hossack et al. (U.S. Publication No. 2003/0097068). Claim 7 was rejected pursuant to 35 U.S.C. §103(a) as being unpatentable over Jong et al. alone or further in view of Hashimoto or Hossack et al., and further in further view of Weng et al. (U.S. Patent No. 5,782,766). Claims 6, 12, 14, and 17-20 were rejected pursuant to 35 U.S.C. §103(a) as being unpatentable over Li in view of Sumanaweera et al. (U.S. Patent No. 6,306,091). This Li based rejection is assumed to be a copying error and treated as based on Jong et al. with or without Hashimoto or Hossack et al. in view of Sumanaweera et al. Claims 9 and 15-16 were rejected pursuant to 35 U.S.C. §103(a) as being unpatentable over Jong et al. alone or further in view of Hashimoto or Hossack et al., and further in view of Li (U.S. Patent No. 5,582,173). Claim 12 was rejected pursuant to 35 U.S.C. §103(a) as unpatentable over Jong et al. alone or further in view of Hashimoto or Hossack et al., and further in view of Sumanaweera et al.

Claims 1, 4, 12, 13, and 18 have been amended. Applicants respectfully request reconsideration of the rejections of claims 1-22, including independent claims 1, 4, 12, 13, and 18.

Independent claim 1 recites acquiring sets of data representing overlapping but different three-dimensional volumes where the volumes have x, y, and z dimensions each extending for multiple voxels, and compounding data from one set with data of the other set. The amendment to claim 1 incorporates a limitation from dependent claim 7, which has been previously considered by the Examiner, and should be considered in this after final response.

Applicant previously noted that Jong et al. assemble different slices into a 3D volume. As noted by the Examiner, a planar scan may capture a certain amount of elevation in a single elevation voxel. Jong et al. disclose each slice along a plane with a single elevation voxel as a volume (col. 4, lines 64-67). By moving a scan head along elevation, the frames of data overlap, are registered and combined into a 3-D EFOV (col. 2, lines 6-15), the extension of the EFOV being the assembled 3D field of view rather than the usual single slice. In the summary, Jong et al. generally describe acquiring overlapping frames or volumes for assembly (col. 5, lines 1-5). In the detained

description, Jong et al. create the 3D EFOV from 2D image frames by registering and combining them (col. 8, lines 43-59). A 1D or 2D array may be used (col. 9, lines 16-30). While the use of a 2D array to scan in three dimensions during movement enables volumes with overlapping speckle patterns to be acquired (col. 9, lines 25-30), there is no disclosure of the size of the volumes. The 3D scan may allow control of the elevation extent of a single voxel and acquiring multiple slices faster than manual translation alone. Since a 3D EFOV is formed from 2D frames based on the earlier disclosures of Jong et al., the 3D EFOV with a 2D array disclosure suggests similar scan but more rapidly. There is no disclosure of acquiring volumes having multiple voxels in all three dimensions and then combining the volumes.

In response, the Examiner alleged that the passage at col. 4, lines 45-55 "makes clear that the assemblage of a complete scan volume by true volumetric increments versus assemblage by scan imaging in single voxel or image thickness increments are both considered as implementations in the alternative." However, the alternative considered by Jong et al. is two types of extended field of view (EFOV). The first is 2-D EFOV where image frames translated on a same plane are assembled to create an EFOV (col. 2, lines 2-7). The second is 3-D EFOV where the image frames lie in different planes and are assembled together to represent a volume (col. 2, lines 7-15). For 3-D EFOV, Jong et al. describe the image frames representing a planar region as having a thickness so that they overlap (col. 2, lines 7-15). The overlap may be used for registration. Accordingly, the cited col. 4, lines 45-55 is clearly referring to assembling data representing planes to represent a volume. The use of "combining 3-D image volumes" means combining the planar image frames of data that have thickness (i.e., overlap in elevation). Jong et al. do not disclose acquiring volumes having multiple voxels in all three dimensions and then combining the volumes.

The Examiner alternatively relies on Hashimoto or Hossack et al. to allege that it would have been obvious to combine data acquired as separate volumes. Applicants respectfully submit that it would not have been obvious to acquire multiple voxel x, y, z dimensional overlapping but different volumes for combination with the disclosures of Hossack et al. Hossack et al. disclose that "preferably, each 3D volume set of data is generated with frames of data positioned closely to frames of data use to generate other 3D volume sets of data" (last sentence of paragraph 114). Hossack et al. disclose use of sets representing a same volume, not overlapping but different volumes. Anisotropic spatial filtering of a volume in Hossack et al. provides compounding of the data representing the same volume. Jong et al. disclose extended field of view by using data sets

representing different locations. Thus a person of ordinary skill in the art would not have used the volume data sets of Hossack et al. with the extended field of view of Jong et al. Similarly, a person of ordinary skill in the art would not have considered volume based extended field of view since Hossack et al. desire completely overlapping volumes.

Applicants respectfully submit that it would not have been obvious to acquire multiple voxel x, y, z dimensional overlapping but different volumes and compounding the volume data based on the disclosures of Hashimoto. Hashimoto stores volumes and corresponding position data (col. 6, lines 58-63). Different volumes represent different times, and are sequentially used for rendering (col. 7, lines 3-16). Sequentially acquired volumes may be used to determine the relative position of the array during acquisition for each of the volumes (col. 15, lines 38-57). The position information is used to correct relative positions between volumes (Fig. 6A) and expansion display (Fig. 6B) (col. 16, lines 29-39). For the wide range expansion display, the volume data is connected by adding only the non-overlapping portions (col. 17, lines 3-18 and col. 19, lines 7-17). Hashimoto does not suggest compounding data from different sets, but instead connecting non-overlapping data for combining three-dimensional volumes. If the plane-based build-up for extended viewing of three-dimensional data of Jong et al. were extended to combining multiple volumes based on the teaching of Hashimoto, the non-overlapping combining of Hashimoto would be used.

The Examiner relies on Weng et al. to show a built-up image being considered a compounded image. However, Weng et al. disclose combination of non-overlapping portions as image growing and compounding as averaging or weighted averaging (col. 10, lines 32-40). Compounding is different from image growing or adding of non-overlapping regions. Modifying Jong et al. based on the teachings for combining three-dimensional volumes of Hashimoto would have used the combination techniques taught by Hashimoto, image growing, not compounding.

Independent claim 4 recites acquiring two volumes with the transducer stationary at different locations. Jong et al. move the transducer during acquisition. Hashimoto also moves the transducer during acquisition and only note a stationary position for acquiring a first volume (col. 15, lines 39-44; and col. 19, line 64-col. 20, line 2). Hossack et al. also mechanically scan the transducer (paragraph 98) or electrically scan (paragraph 97). The Examiner does not cite to both translation and holding stationary.

Independent claim 12 recites morphing a feature as a function of pressure distortion. The Examiner relies on Sumanaweera et al for these limitations. However, Sumanaweera et al. avoid the effects of pressure by using local rigid body analysis instead of global (col. 15, lines 8-21). Sumanaweera et al. do not disclose morphing in the cited section.

Independent claims 13 and 18 recites volumes having multiple voxels in all three dimensions and compounding or a processor operable to compound data from the sets, and are thus allowable for similar reasons as claim 1.

Dependent claims 2, 3, 5-11, 14-17, and 19-22 depend from the independent claims discussed above, and are thus allowable for at least the same reasons. Further limitations distinguish the dependent claims from the cited references. Claim 15 recites a wobbler. Li notes use of mechanical structure for scanning (col. 1, lines 63 – Col. 2, line 7), but teaches against the use of such structures. Thus a person of ordinary skill in the art would not have used a wobbler from Li in Jong et al.

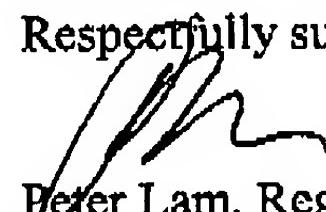
CONCLUSION

Applicants respectfully submit that all of the pending claims are in condition for allowance and seeks early allowance thereof. If for any reason, the Examiner is unable to allow the application but believes that an interview would be helpful to resolve any issues, he is respectfully requested to call the undersigned at (650) 943-7350 or Craig Summerfield at (312) 321-4726.

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